

REMARKS

Claims 1-10 are pending. Claim 11 has been canceled without prejudice. Claim 1 and the specification have been amended for clarity.

No new matter has been added by way of the above-amendment.

Issues Under 35 U.S.C. 103(a)

The following rejections have been maintained:

- (A) Claims 1-7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miura '662 in view of Ditzel '585; and
- (B) Claims 8-10 are rejected under 35 U.S.C. 103(a) as being obvious over Miura '662 in view of US '541.

Applicants respectfully traverse both Rejection (A) and Rejection (B).

In response to Applicants' arguments in the June 29, 2007 Amendment, the Examiner states:

Applicants focus on both the rejections of claims 1-7 and 8-10 is that the instant claims purport to an "adjustment of carbon monoxide partial pressure and a methyl acetate concentration to thereby restrain the production of acetaldehyde". Applicants contend that said adjustment effectuates to an improved acetic acid production, while restraining the production of a detrimental by-product, acetaldehyde. However, Applicants' arguments do not mirror the recitation of the claims, as amended; i.e. the claims are deficient in the recitation of said adjustment. Further, the instant claims are clear in the recitation that the carbon monoxide partial pressure and a methyl acetate concentration are constant during the reaction; as furthered typified and supported in the instant specification, under Examples pages 34 ff. The combined teachings of the cited prior art references, thus, *in toto*, fairly suggest the *prima facie* obviousness of the instant claims. (See paragraph "23" of the outstanding Office Action).

In response to the Examiner's assertion that Applicants' arguments do not mirror the recitation of the claims, Applicants have amended claim 1 to require that the method for producing acetic acid, comprises:

Step a) continuously reacting methanol with carbon monoxide in the presence of a rhodium catalyst, an iodide salt, methyl iodide, methyl acetate, and water; and

Step b) thereby producing acetic acid at a production rate of 11 mol/L·hr or more while keeping the acetaldehyde content of a reaction mixture to 500 ppm or less, wherein the reaction is carried out under the following conditions:

Condition i) at a carbon monoxide partial pressure in a gaseous phase of a reactor of 1.05 MPa or more and

Condition ii) at a methyl acetate content of the reaction mixture of 2 percent by weight or more to thereby keep the production rate of acetaldehyde to 1/1500 or less of the production rate of acetic acid.

Based on this Amendment, the presently claimed method now requires both **Condition i** and **Condition ii**. Accordingly, the presently claimed method reflects Applicants' arguments and is fully supported by the present specification and Examples. Applicants now explain in detail why the presently claimed invention is not made obvious by Miura '662 and either Ditzel '585 or US '541

An object of the present invention is to provide a method for efficiently producing high-purity acetic acid, which method can reduce production of by-products without reducing the reaction rate of acetic acid. Especially, the present inventors made detailed investigations of reaction conditions, and found that of the factors involved in the reactions, only the CO partial pressure in the gaseous phase of the reactor and the methyl acetate content of the reaction mixture serve to accelerate the main reaction while inhibiting side reactions regardless of the hydrogen partial pressure (See page 12~13 of the present specification, especially Table 1 in page 12). The present inventors also revealed that high-purity acetic acid can be efficiently produced at low costs by selecting the combination of factors including acetaldehyde content of the reaction mixture, acetic acid production rate, and the proportion of acetaldehyde production rate to acetic acid production rate, thus achieving the present invention.

The Examiner will note that Condition ii of the present claim 1 refers to a "production rate" of the acetaldehyde. Miura '662 teaches maintaining the acetaldehyde content of a reaction mixture to 400 ppm or less. However, Miura '662 teaches keeping a low acetaldehyde content by *removing* acetaldehyde from process liquid circulating in the reactor. Miura '662 fails to teach or suggest the instant method wherein the by-production of acetaldehyde itself is inhibited. Therefore, Miura '662 does not disclose nor suggest keeping the *production rate* of acetaldehyde to 1/1500 or less of the production rate of acetic acid.

Furthermore, Miura '662 is completely silent about other important conditions which should be executed concurrently, such as producing acetic acid at a production rate of 11 mol/L•hr or more, carrying out the reaction at a carbon monoxide partial pressure of 1.05MPa and at a methyl acetate content of the reaction mixture of 2 percent by weight or more in order to keep the production rate of acetaldehyde to 1/1500 or less of the production rate of acetic acid.

In this connection, Applicants note the Examiner's statement that in lines 45-46 of page 4, Miura '662

states the partial pressure of carbon monoxide is preferably 4 to 5 atm. (See paragraphs "8" and "17" of the outstanding Office Action).

Applicants respectfully disagree. Miura '662 states that preferred carbon monoxide partial pressure is 5 to 15 atm.

As such, significant patentable distinctions exist between the present invention and the teachings of Miura '662.

With respect to Ditzel '585, Ditzel '585 teachings conflict with both the present invention and the teachings of Miura '662. Ditzel '585 discloses an improved carbonylation reaction of a lower alcohol in the presence of Rh catalyst and alkyl halide using promoter. In column 4, lines 36-45, Ditzel '585 states that an increased rate of carbonylation reaction can be achieved, even at relatively low partial pressures of carbon monoxide. Additionally, Ditzel '585 states a preferred CO partial pressure is 1-5bar (0.1-0.5MPa) as the Examiner pointed. However, this range is out of the scope of the CO partial pressure of the present invention.

These teachings of Ditzel '585 conflict with the method of the present invention. Just as important, these teachings of Ditzel '585 conflict with Miura '662 and these differences would not be ignored by the artisan looking to modify the method of Miura '662 to obtain the inventive method.

Ditzel '585 teachings are not concerned with by-production of acetaldehyde, though he simply mentions the formation of by-products. Thus, Ditzel '585 is completely silent about keeping the acetaldehyde content of a reaction mixture to 500 ppm or less, and keeping the production rate of acetaldehyde to 1/1500 or less of the production rate of acetic acid.

In Item "10" of the outstanding Office Action, the Examiner states that

In Example 21 column 19 line 66, US '585 states that the production rate is 10.70 mol/L·hr.

However, Applicants cannot compare the production rate in Ditzel '585 with that in the present invention definitely, since Ditzel '585 calculate the production rate based on amount of provided carbon monoxide. However, 10.70mol/L·hr is out of the scope of the present invention. In addition, the product of the Example 21 is not acetic acid. The Example 21 carries out the reaction in the absence of water and thereby yields acid anhydride. Therefore, the Example 21 is different from the present invention in which the reaction is carried out in the presence of rhodium catalyst, an iodide salt, methyl iodide, methyl acetate, and water (claim 1). This is true also of Example 23. Example 23 does state a production rate of 11.67 mol/L·hr. However, Example 23 also carries out the reaction in the absence of water to yield acid anhydride.

As is stated above, the reaction conditions stated in the claims of the present invention are neither taught nor suggested in these cited references. The cited references are completely silent about producing acetic acid at a production rate of 11 mol/L/hr or more, and keeping the production rate of acetaldehyde to 1/1500 or less of the production rate of acetic acid. Therefore, a person skilled in the art could not achieve the present invention with reference to Miura '662 and further in view of Ditzel '585.

With respect to carbon monoxide partial pressure, Miura '662 states that a partial pressure of carbon monoxide can be changed in a wide range. Ditzel '585 proposes a partial pressure of carbon monoxide which is out of the scope of the present invention. Therefore, if a

person skilled in the art combines the concept of Miura '662 and Ditzel '585, he could not achieve a method of the present invention in which the reaction is carried out at a carbon monoxide partial pressure in gaseous phase of a reactor of 1.05 MPa or more thereby keeping the production rate of acetaldehyde to 1/1500 or less of the production rate of acetic acid.

According to the method for producing acetic acid of the present invention, the production rate of acetaldehyde can be adequately suppressed by maintaining the carbon monoxide partial pressure and methyl acetate content within the inventive ranges. Therefore, high-purity acetic acid can be efficiently produced, reducing formation of by-products without reducing the reaction rate of acetic acid.

Concerning claims 8-10, since US '541 does not cure the deficiencies of Miura '662, as discussed above, these claims are patentable also.

Based on the foregoing, withdrawal of Rejection (A) and Rejection (B) is respectfully requested.

Conclusion

In view of the above remarks, it is believed that claims are allowable.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D., Esq., Reg. No. 43,575 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

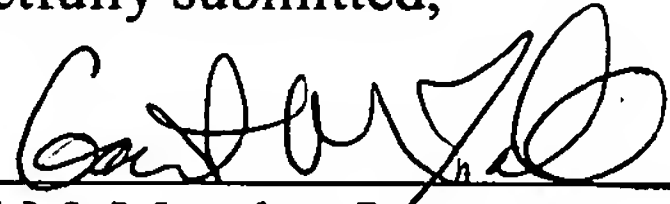
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If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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